APPENDIX:
DATA AND ANALYSIS

The monograph by Pulsinelli, Borland, and Goff (PBG) attempted to demonstrate a link between WKU enrollment gains and athletic success in men's basketball and football. The data used for the PBG study were provided by Dr. Goff and are listed in Table 1 at the end of this Appendix. We describe and evaluate the PBG model, which poorly describes the data and fails to identify the major factor in Western's enrollment changes. Further statistical analysis of the same data provides a model that better describes the data, identifies the major factor relating to WKU enrollment, and indicates that WKU sports performance has no significant effect on enrollment.

Enrollment at WKU and at Other Kentucky Colleges and Universities

Before evaluating the results and conclusions of the PBG paper, it is informative to graph the set of enrollment data, as in Figure 1, to provide a general overview of its behavior. Several points are evident from a comparison between the FTS enrollments for WKU and the FTS enrollments for the rest of Kentucky. Figure 1 reveals similar trends or "movements" in the two curves, and shows that variations about the trends are also remarkably similar to each other. The similarities between enrollment behavior for WKU and for the rest of Kentucky are also dramatically evident in a comparison of the *changes* in enrollment each year, as shown in the graph of Figure 2.

Clearly, a major factor related to the change in WKU enrollment each year is the change in the size of the "pool" of students entering Kentucky colleges and universities. A strong relationship is to be expected, and the data suggest that it is in effect. We shall later show from statistical analysis that the changes in the two enrollments are strongly correlated. We should be surprised if they were not, and we should view with suspicion any model that indicates no connection between increases in the "pool" size and corresponding increases in Western's enrollment. The PBG model for enrollment changes failed to reflect the connection with statewide enrollment changes.

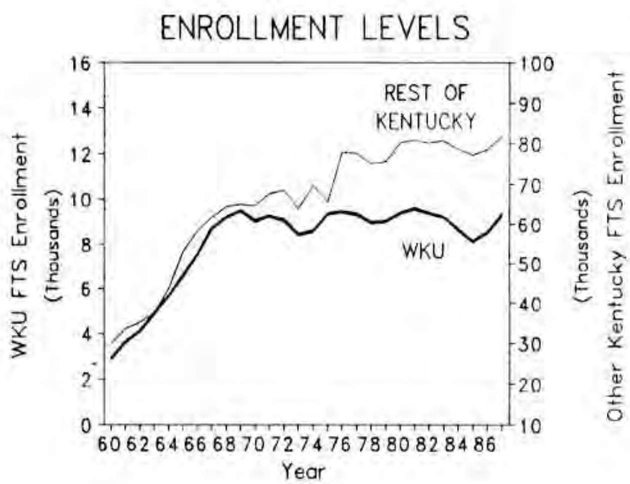

Figure 1 -- Comparison between FTS enrollment for WKU and FTS enrollment for the rest of Kentucky, for the period 1960 - 1987.

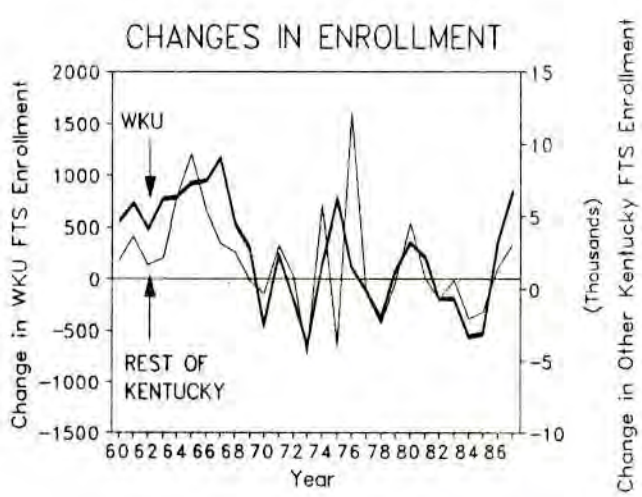

Figure 2 -- Comparison of changes in FTS enrollment for WKU and changes for the rest of Kentucky.

WKU—Printing paid from state funds, KRS 57.375.

Basis and Description of the PBG Model

The basic hypothesis of the PBG monograph was stated as follows:

Students who opt to attend WKU (and similar schools) view college partly as an investment, and partly as a consumption. We believe that they get more consumption enjoyment from schools that have athletic programs than they do from school's that don't. When choosing among schools that do offer athletic programs, such students prefer schools that have winning records to those that don't. As a consequence, we hypothesize that college athletics has an impact on a specific school's enrollment. [PBG, p. 15]

PBG proceeded to develop a statistical model as follows:

We have chosen to use the ARIMA (Autoregressive Integrated Moving Average) statistical method to control for systematic movements in enrollment. This is a commonly employed technique for modeling time series data. The technique takes a time series of data, such as enrollment at WKU, and by differencing the series and/or by using lagged values and/or moving average terms, provides a statistical representation of movements in the series. Intuitively, the idea is to extract as much information as possible from the series itself about systematic movements in the series. The "best" representation is then chosen on the basis of explanatory power, uncorrelated residuals, and simplicity. [PBG, p. 16]

PBG then included additional variables, such as WKU sports records, in the modeling process. The resulting model, which was offered in the PBG paper [PBG, p. 17] as a statistical representation of the yearly difference or change in Western's FTS enrollment during the period 1960-1988, is restated below (following clarification of notation by Dr. Goff):

PBG Difference Model (PBG)

$$DWKU_{(t)} = -837.0 + 0.67\,(WKU_{(t-1)} - WKU_{(t-2)}) + 1723.4\ B2LA + 341.0\ FPOST12$$

Student t statistic:	(4.20)	(2.79)	(1.71)
Significance level, α:*	0%	0.5%	5%

(**Significance level* relates to the probability of error in accepting an apparent correlation, which is due to chance alone, if the variables are actually uncorrelated. 0% is least likely spurious.)

where
$WKU_{(t)}$ = WKU FTS enrollment in a given year, t
$WKU_{(t-1)}$ = WKU FTS enrollment in the previous year, t-1
$WKU_{(t-2)}$ = WKU FTS enrollment two years prior, t-2
$DWKU_{(t)}$ = Difference in WKU FTS enrollment, $WKU_{(t)} - WKU_{(t-1)}$
B2LA = WKU Basketball win record, 2 year lagged average
(Average of records for years t-1 and t-2)
FPOST12 = WKU Football lagged post-season participation index
(1 if participated in either of last 2 years, 0 otherwise)

Based on this model, the PBG paper concluded that:

"... a 0.500 winning percentage in basketball over two prior seasons is associated with an 862 = (0.500 x 1723) increase in full-time student enrollment over a season with no wins; post-season participation in either of the two prior seasons is associated with 341 = (1 x 341) more full-time students than if no post-season play had occurred." [PBG, pp. 17-18]

Numerical predictions of the PBG model are presented in Table 2, and further analyses are given in the following sections of the Appendix.

Problems with the PBG Model

A reasonable outcome to expect of a statistical model would be to represent a set of observed data as accurately as possible. The set of prediction excesses, or residuals (model value - observed value) should be as small as possible (i.e., should have small variance or standard deviation). Also the residuals should be, effectively, white noise, which has a stationary mean of zero.

Before discussing the problems with the full PBG model, it is informative to illustrate the nature of an ARIMA model without inclusion of separate variables, such as sports. An "ARIMA-ONLY" model [PBG, p. 16], with coefficients determined and privately communicated by Dr. Goff, predicts changes in WKU enrollment as follows:

$$DWKU_{(t)} = 323.7 + 0.621\,(\,WKU_{(t-1)} - WKU_{(t-2)}\,) \qquad \text{(PBGAO)}$$

In Figure 3 we plot the predictions of the ARIMA-ONLY model for comparison with the observed enrollment changes at WKU. The prediction of the enrollment change for a given year is estimated from the previous year's change by carrying forward 62.1% of the previous change and adding the constant 323.7. The similar fluctuations in the two curves result because the model curve is essentially a fractional replica of the observed curve, time-shifted forward by one year.

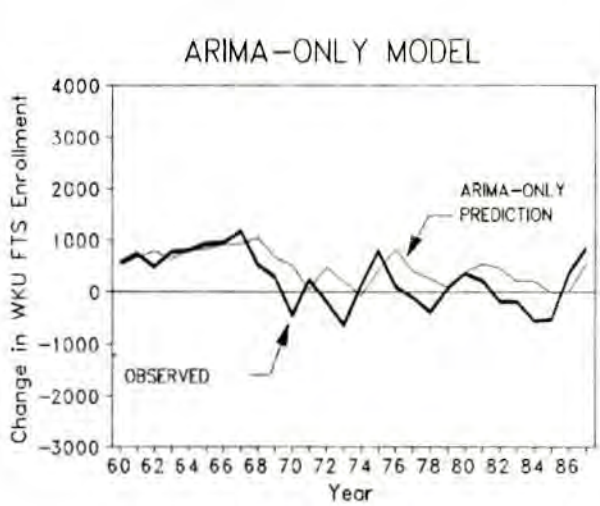

Figure 3 -- Comparison of the observed changes in WKU enrollment with an ARIMA-ONLY model.

The ARIMA-ONLY model residuals, representing the excesses of the predictions over actual changes in enrollment, are plotted in Figure 4. The residuals do not have a mean value of zero, but are predominately positive. This means that the ARIMA-ONLY model generally *predicts greater enrollment increases than actually occurred.*

We also note that the difference between the observed and predicted curves is not substantively correlated with WKU sports records. The square of the correlation coefficient, giving the proportion of the variance of the dependent variable that can be accounted for by linear prediction from the independent variable, is 0.05 for the men's basketball winning percentage and 0.07 for the two-year lagged average of the basketball record.

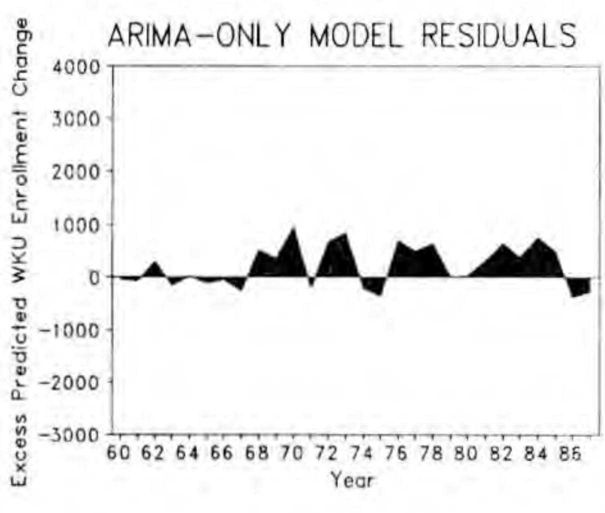

Figure 4 -- Residuals from the ARIMA-ONLY model: (Residual = Predicted - Observed).

The full PBG model for differences or changes in WKU enrollment [PBG, p. 17] consists of a basic ARIMA component, which we shall call the ARIMA BASE, and the addition of separate variables for sports (specifically a two-year lagged average of the men's basketball win record and an index of post-season football participation in the two preceding years). The predictions of this PBG model are plotted in Figure 5 for comparison with the observed WKU enrollment changes.

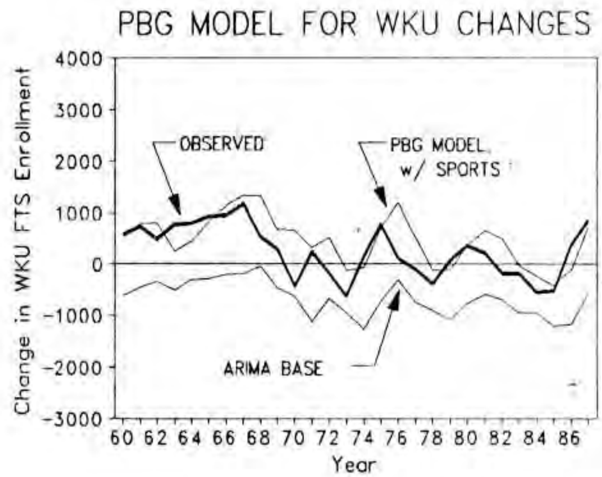

Figure 5 -- Comparison of the observed changes in WKU enrollment and the PBG model predictions for these changes.

The curve labeled "ARIMA BASE" represents the ARIMA component of the PBG model, that is, the PBG model less sports terms. The relative contribution of the basic ARIMA component and the effects of the posited sports terms can also be compared in Figure 5. The "ARIMA BASE" falls far short of the observed curve, making room for presumed additive effects such as the hypothetical relation between sports performance and enrollment. The similar fluctuations in all of the curves result because the ARIMA process carries forward most of the change from the preceding year as a predictor of the change for the current year. The model fluctuations are time-shifted forward by one year in relation to the similar fluctuations in the observed curve. The model fluctuations arise in the "ARIMA BASE" curve and are not basically due to sports. The added sports terms essentially restore the deficit created by the lowered ARIMA base. In this way, the enrollment increases attributed by the PBG model to sports alone turn out to be, on average, 890 students greater than the actual enrollment increases that occurred due to all causes.

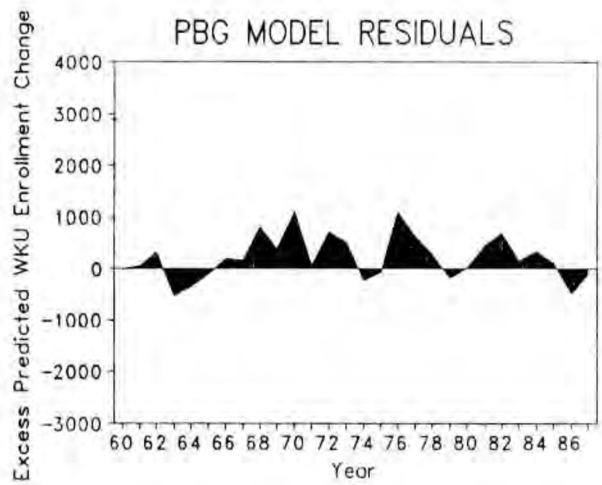

Figure 6 -- Residuals from the PBG model: (Residual = Predicted - Observed).

The residuals of the full PBG model are plotted in Figure 6. The PBG residuals have a non-zero mean and are systematically positive, meaning that *the model generally predicts larger enrollment changes than actually occurred.* The sports terms do not appear to be justified, since the difference between the observed changes and the ARIMA base *is not substantively correlated with the sports data* ($r^2 = 0.06$).

The authors of the PBG paper further noted, based on their model, "... that enrollment changes in all other Kentucky colleges and universities provided no additional explanatory power for enrollment changes at WKU." [PBG, p. 18] Apparently, in controlling for systematic movements in the series, *the PBG model has effectively filtered out the closely correlated and systematically related effect of variations in the statewide pool of potential students.*

Alternative Studies of Possible Correlations

We report the results of an alternative statistical analysis of the enrollment data. The ARIMA process is effectively a form of digital filter, which modifies the processed data set in ways that may not be fully understood by the investigator or by his/her readers. Therefore, we have applied a more straightforward multiple-regression correlation analysis. In this process, the correlation, or lack of correlation, between the change in WKU enrollment and various possible independent variables, such as statewide enrollment changes and WKU athletic performance, can be demonstrated without obscurative filtration.

Multiple-regression analysis yielded the following preliminary analysis of possible correlations between the observed changes in WKU enrollment and several independent variables, including changes in enrollment at all other Kentucky colleges and indices of athletic performance in the major men's sports at WKU:

Preliminary Multiple-Regression Investigation for Detecting Correlations (PCOR)

$$\mathbf{DWKU_{(t)} = -148 + 0.139\ DOKYLA} + 774\ B2LA - 107\ BPOST12 - 466\ F2LA + 46\ FPOST12$$

	DOKYLA	B2LA	BPOST12	F2LA	FPOST12
Coef Std Error, σ:	**[0.039]**	[731]	[221]	[497]	[288]
Coef in σ units:	**3.6σ**	1.1σ	0.5σ	0.9σ	0.2σ
Student t statistic:	**(3.52)**	(1.06)	(-0.48)	(-0.94)	(0.16)
Significance level, α:*	**0%**	15%	32%	18%	44%
Significant at α=5%?	**Yes**	*No*	*No*	*No*	*No*

(**Significance level* relates to the probability of error in accepting an apparent correlation, which is due to chance alone, if the variables are actually uncorrelated. 0% is least likely spurious.)

where $DWKU_{(t)}$ = Difference in WKU FTS enrollment, $WKU_{(t)} - WKU_{(t-1)}$
DOKYLA = Difference in Other Kentucky FTS enrollment, Lagged Average (lagged average of $DOKY_{(t)}$ and $DOKY_{(t-1)}$)
B2LA = WKU Basketball win record, 2 year lagged average
BPOST12 = WKU Basketball lagged post-season participation index
F2LA = WKU Football win record, 2 year lagged average
FPOST12 = WKU Football lagged post-season participation index

Although we note from these results that two of the possible correlations with WKU sports records are negative correlations (in the sense that better sports performance correlates with a decrease in enrollment), we must emphasize that *none of the sports correlations is statistically significant*. According to standard practice, effects that appear to be detected at levels less than 2σ are not considered to have been demonstrated by the data. The best positive correlation with WKU sports is with the lagged average of the win record in men's basketball, and even this is marginally suggested at only 1.1σ. The conclusions indicated by this analysis are:

- The *only* significant factor yet identified as correlated with the observed change in WKU enrollment is the change in enrollment across the Commonwealth of Kentucky.
- There is *no significant correlation* with WKU football or men's basketball.
- The notion that WKU sports performance relates to changes in WKU enrollment *is not supported by the data.*

Regression Model (CORR)

Retaining the only significantly correlated effect -- enrollment changes across the Commonwealth -- we obtain the following regression model for changes in Western's enrollment:

Regression Model of Correlation (CORR)

$$\mathbf{DWKU_{(t)} = -7 + 0.137\ DOKYLA}$$

Coef Std Error, σ:	**[0.030]**
Coef in σ units:	**4.6σ**
Student t statistic:	**(4.64)**
Significance level, α:*	**0%**
Significant at α=5% ?	**Yes**

(**Significance level* relates to the probability of error in accepting an apparent correlation, which is due to chance alone, if the variables are actually uncorrelated. 0% is least likely spurious.)

where $DWKU_{(t)}$ = Difference in WKU FTS enrollment, $WKU_{(t)} - WKU_{(t-1)}$
DOKYLA = Difference in Other Kentucky FTS enrollment, Lagged Average (lagged average of $DOKY_{(t)}$ and $DOKY_{(t-1)}$)

On the basis of the CORR model, Western's enrollment is expected, on average, to increase by about 14% of the lagged average of the changes in combined enrollment at all other Kentucky colleges and universities for the current and previous year. The latter quantity is indicative of the "pool" available for enrollment increases within the Commonwealth.

The results of the CORR analysis are given in Table 3 and are plotted in Figure 7, comparing the observed changes in WKU enrollment with the model predictions. Figure 8 represents the residuals for this model. Both Figures 7 and 8 are plotted to the same scale as Figures 5 and 6 to allow visual comparison of the quality of prediction of this model with the PBG model.

Figures 7 and 8 show that the CORR model provides a better description of the data than is provided by the PBG model (see Figures 5 and 6). The residuals from the CORR model, (predicted values minus actual data) have zero mean, and are essentially random. Moreover, they do *not* correlate with the sports performance indices that have been tried in previous analyses.

The residuals represent variations due to the combined effects of many undetermined factors that have not been included -- factors such as recruiting efforts, admissions policies, inducements for students from neighboring states, and fluctuations in retention and graduation rates, among numerous other possibilities.

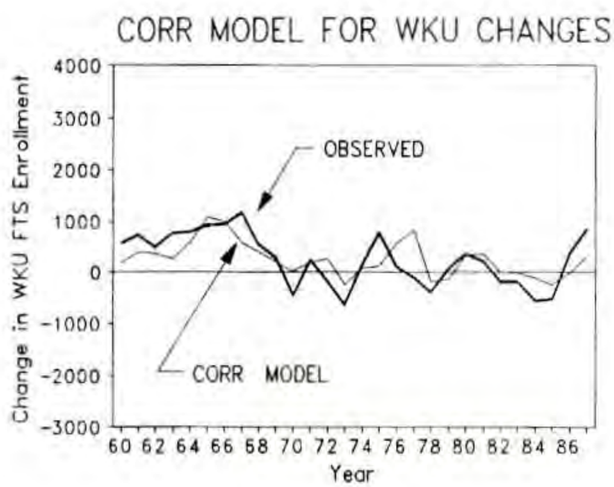

Figure 7 -- Comparison of observed changes in WKU enrollment and predictions from the correlation analysis (CORR).

The CORR model residuals, plotted in Figure 8, indicate that the CORR model is a better representation than the PBG model, according to the criteria established by PBG:

> *The "best" representation is then chosen on the basis of explanatory power, uncorrelated residuals, and simplicity.* [PBG, p. 16]

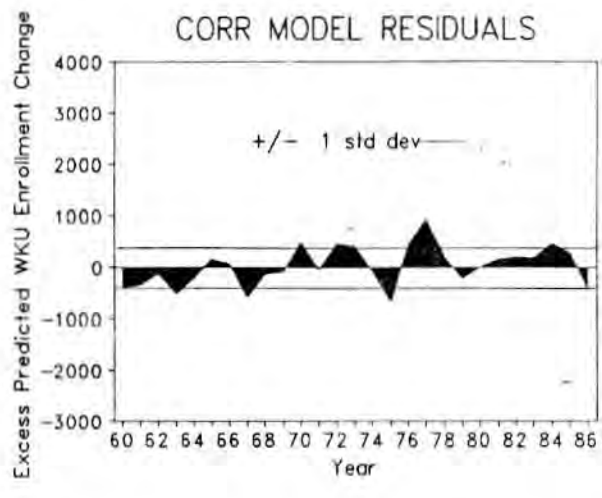

Figure 8 -- Residuals from CORR analysis: (Residual = Predicted - Observed).

The goal of simplicity is clearly met with the straightforward linear regression of the CORR model, as contrasted with the PBG ARIMA model. In addition, the CORR model residuals are uncorrelated, have mean zero, and are essentially white noise. Further comparisons of the behavior of the PBG model and the behavior of the CORR model are given in the next section.

CORR Model Stability and Least-Squares Minimization

As a test of the stability of the CORR model over the time period covered by the data, the data set was divided in half, and the first half was used to determine the regression relationship between changes in WKU enrollment and changes in other Kentucky enrollment. The regression based on the first half of the data was then used to predict the later half. As can be seen in Figure 9, the results are comparable to the full CORR model shown in Figure 7. Therefore, the CORR model is stable and applies over the entire data set.

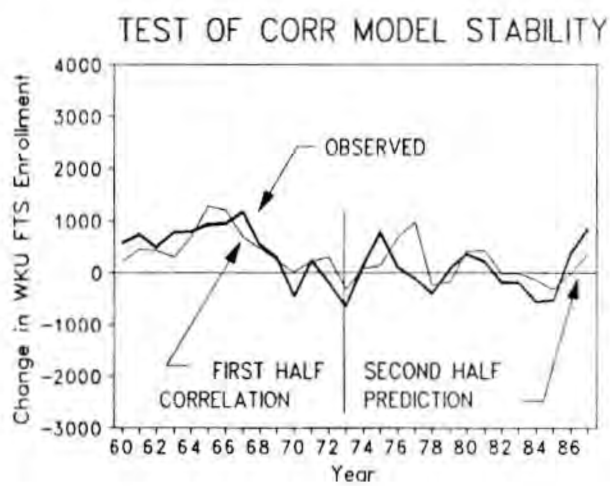

Figure 9 -- Comparison of observed changes in WKU enrollment with predictions based on regression of first half of the data set.

An indication of the quality of fit between a model and a data set is the degree to which the model minimizes the sum of the squared residuals (SSR). If a certain set of values for the model coefficients accomplishes this minimization, then any increase or decrease in the value of a coefficient, relative to its nominal value, should result in an increase in the SSR. The behaviors of the PBG and CORR models in this regard are contrasted in Figures 10 and 11, respectively.

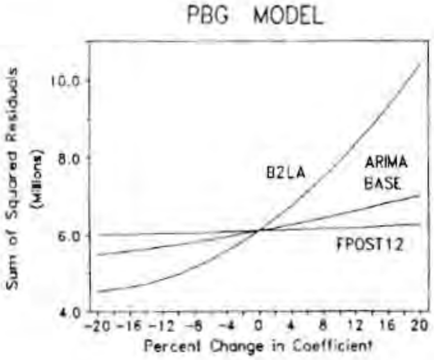

Figure 10 -- Effect of coefficient variation on SSR in the PBG model.

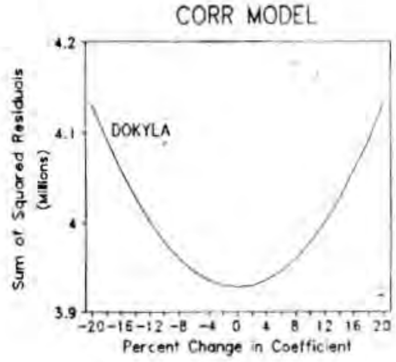

Figure 11 -- Effect of coefficient variation on SSR in the CORR model.

In the PBG model, none of the reported coefficients results in a minimization of the SSR. That is, the quoted values do not result in a least-squares representation of the data at their nominal values (corresponding to 0% change on the abscissa). It is clearly possible to reduce the SSR by changing any PBG coefficient in the proper direction. Decreasing any of the PBG coefficients would decrease the SSR; hence it is not minimized.

In the CORR model, the DOKYLA (difference in other Kentucky, lagged average) regression coefficient minimizes the SSR. Furthermore, the value of the SSR at minimum in the CORR model (3.93 M) is much lower than the value from the PBG model (6.11 M). The CORR model is a least-squares optimized representation of the data, and the PBG model is not.

Evaluation of Hypothetical Sports Effects

The ill-fitting PBG model served as a basis for positing a strong effect of sports performance on enrollment changes at WKU. In fact, the PBG report suggests that Western's enrollment changes should experience a sports-related contribution of about 1200 students per year following two years of break-even performance by the men's basketball team and a post-season participation by the football team [PBG, pp. 17-18]. Furthermore, the PBG model implies that winning seasons in basketball would result in even larger enrollment changes, increasing Western's enrollment by, say, 1400 to 2000 students in a year's time. The PBG model predicts changes, attributed only to sports, that are much greater than the *total* changes that have actually occurred in Western's enrollment. The results are not consistent with the lack of correlation between the sports data and the difference between the observed data and the ARIMA base, which the sports effects are supposed to explain.

A realistic estimate of the effect on enrollment that *might* be attributable to sports performance can be made using the correlation models. Recall that, in the preliminary PCOR investigation, all sports correlations were less than 2σ effects (and not significant at the $\alpha = 5\%$ level). Among these insignificant terms, the best positive correlation was indicated for basketball performance (B2LA, 1.1σ). The next best correlation, a *negative* correlation between enrollment and football (F2LA, 0.9σ), was omitted from the following analysis so that it would not dilute the upper limit of sports effects estimated by the marginal basketball correlation. However, it was noted that the effect of a win/loss record was implicitly given an over-optimistic interpretation beginning with the PBG paper. There it was *assumed* that such an effect would be entirely additive; for example, if a 1.000 season would attract 1000 students, then a 0.100 season would attract 100 students.

Actually, the PBG paper statement that "students prefer schools that have winning records to those that don't" [PBG, p. 15] contains the implication that losing seasons dis-entice the "consumption-motivated students," who would then choose another school. Therefore, the proper variable to include in the correlation is B2LA.5 = B2LA - 0.500, (*i.e.*, the excess of wins over losses) which is positive for winning records and negative for losing records. The effect of this translation to the center of the range is to reduce the constant term in the model by half of the coefficient of the basketball term. It does not change the multiplicative coefficient of the basketball term. We performed a subsequent multiple-regression correlation analysis (SCOR) including DOKYLA and B2LA.5, for the purpose of establishing the maximum positive sports contribution admissible by the data. The SCOR regression indicated the following relationship:

$$\mathbf{DWKU_{(t)} = -60 + 0.131\ DOKYLA} + \mathit{547\ B2LA.5} \qquad \text{(SCOR)}$$

The basketball correlation is still *insignificant*, at 1.1σ, but it establishes an upper bound for possible sports effects in the data set. Using the SCOR model, we calculated the effects of the marginal basketball term considering Western's actual win/loss record from 1960 through 1987. The peak contributions of this term were +212 and -143. The average yearly net enrollment gain that is consistent with the marginal basketball correlation is +62 students per year.

Referring to the significant CORR model results shown in Figure 7, the admissible average effect of sports is entirely contained within the thickness of the line used to plot the actual WKU enrollment changes. The admissible effect is not only small, but also the upper limit for such effects, which are actually undetectable in the data. **There is no significant relationship between intercollegiate sports performance and enrollment at Western Kentucky University.**

To summarize the results of detailed statistical analyses given in this Appendix, we note the following conclusions:

- The PBG model is a poor representation of the actual enrollment changes at WKU. It also fails to detect the major factor that relates to WKU enrollment changes.
- The CORR model provides a good statistical representation of the data. It indicates that the only significant factor yet identified as correlated with the observed change in WKU enrollment is the change in enrollment throughout Kentucky.
- The maximum effect of sports that would be consistent with the data averages only 62 students per year, although there is no significant correlation with any of the sports indices considered by PBG.
- **There is no basis for assuming a significant effect of sports performance on enrollment at Western Kentucky University.**

TABLE 1

ENROLLMENT DATA AND WKU SPORTS RECORDS

YEAR (t)	WKU Enrollment (FTS)	OTHER KY Enrollment (FTS)	WKU Men's Basketball Season Record	WKU Men's Basketball Post-Season Participation	WKU Football Season Record	WKU Football Post-Season Participation
58	2024	27516	0.615	0	0.444	0
59	2323	28074	0.750	1	0.556	0
60	2882	30062	0.692	0	0.278	0
61	3613	33672	0.630	1	0.667	0
62	4091	35357	0.238	0	0.625	0
63	4861	37447	0.238	0	0.955	1
64	5647	43798	0.667	0	0.650	0
65	6569	53099	0.893	1	0.300	0
66	7512	58525	0.885	1	0.500	0
67	8677	61724	0.720	0	0.833	0
68	9207	64305	0.615	0	0.750	0
69	9496	64878	0.880	1	0.650	0
70	9037	64547	0.800	1	0.850	0
71	9266	67545	0.577	0	0.800	0
72	9067	68386	0.385	0	0.700	0
73	8424	63861	0.600	0	0.923	1
74	8570	69606	0.667	0	0.700	0
75	9346	65651	0.690	1	0.846	1
76	9453	77830	0.385	0	0.450	0
77	9343	77502	0.533	1	0.150	0
78	8959	75094	0.607	0	0.800	0
79	9032	75549	0.724	1	0.500	0
80	9378	80083	0.724	1	0.900	0
81	9586	80815	0.655	0	0.545	0
82	9393	80114	0.429	0	0.500	0
83	9204	80696	0.414	0	0.227	0
84	8645	78621	0.500	0	0.182	0
85	8110	77035	0.742	1	0.364	0
86	8476	78468	0.763	1	0.409	0
87	9308	81569	0.536	0	0.636	1
88	9844	?	0.482	0	0.692	1

TABLE 2

VARIABLES AND PREDICTIONS OF THE PBG MODEL

YEAR (t)	DWKU (FTS)	WKU(t-1) (FTS)	WKU(t-2) (FTS)	B2LA	BPOST12 *	F2LA *	FPOST12	PBG ARIMA BASE	PBG MODEL PREDICTION	PBG MODEL RESIDUAL
60	559	2323	2024	0.683	1	0.500	0	-637	540	-19
61	731	2882	2323	0.721	1	0.417	0	-462	780	49
62	478	3613	2882	0.661	1	0.473	0	-347	792	314
63	770	4091	3613	0.434	1	0.646	0	-517	231	-539
64	786	4861	4091	0.238	0	0.790	1	-321	430	-356
65	922	5647	4861	0.453	0	0.803	1	-310	810	-112
66	943	6569	5647	0.780	1	0.475	0	-219	1125	182
67	1165	7512	6569	0.889	1	0.400	0	-205	1327	162
68	530	8677	7512	0.803	1	0.667	0	-56	1327	797
69	289	9207	8677	0.668	0	0.792	0	-482	668	379
70	-459	9496	9207	0.748	1	0.700	0	-643	645	1104
71	229	9037	9496	0.840	1	0.750	0	-1145	303	74
72	-199	9266	9037	0.689	1	0.825	0	-684	503	702
73	-643	9067	9266	0.481	0	0.750	0	-970	-141	502
74	146	8424	9067	0.493	0	0.812	1	-1268	-78	-224
75	776	8570	8424	0.634	0	0.812	1	-739	694	-82
76	107	9346	8570	0.679	1	0.773	1	-317	1193	1086
77	-110	9453	9346	0.538	1	0.648	1	-765	502	612
78	-384	9343	9453	0.459	1	0.300	0	-911	-120	264
79	73	8959	9343	0.570	1	0.475	0	-1094	-112	-185
80	346	9032	8959	0.666	1	0.650	0	-788	359	13
81	208	9378	9032	0.724	1	0.700	0	-605	643	435
82	-193	9586	9378	0.690	1	0.723	0	-698	491	684
83	-189	9393	9586	0.542	0	0.523	0	-966	-32	157
84	-559	9204	9393	0.422	0	0.364	0	-964	-237	322
85	-535	8645	9204	0.457	0	0.205	0	-1212	-424	111
86	366	8110	8645	0.621	1	0.273	0	-1195	-125	-491
87	832	8476	8110	0.753	1	0.387	0	-592	705	-127
88	536	9308	8476	0.650	0	0.523	0	-280	840	304

*These variables were not retained in the final PBG model.

TABLE 3

VARIABLES AND PREDICTIONS OF THE CORR MODEL

YEAR (t)	DWKU	DOKY	DOKYLA	CORR MODEL PREDICTION	CORR MODEL RESIDUAL
60	559	1988	1273.0	168	-391
61	731	3610	2799.0	378	-353
62	478	1685	2647.5	357	-121
63	770	2090	1887.5	253	-517
64	786	6351	4220.5	573	-213
65	922	9301	7826.0	1068	146
66	943	5426	7363.5	1005	62
67	1165	3199	4312.5	586	-579
68	530	2581	2890.0	390	-140
69	289	573	1577.0	210	-79
70	-459	-331	121.0	10	469
71	229	2998	1333.5	176	-53
72	-199	841	1919.5	257	456
73	-643	-4525	-1842.0	-260	383
74	146	5745	610.0	77	-69
75	776	-3955	895.0	116	-660
76	107	12179	4112.0	558	451
77	-110	-328	5925.5	807	917
78	-384	-2408	-1368.0	-195	189
79	73	455	-976.5	-141	-214
80	346	4534	2494.5	336	-10
81	208	732	2633.0	355	147
82	-193	-701	15.5	-5	188
83	-189	582	-59.5	-15	174
84	-559	-2075	-746.5	-109	450
85	-535	-1586	-1830.5	-258	277
86	366	1433	-76.5	-17	-383
87	832	3101	2267.0	305	-527